NASA SBIR/STTR Technologies

Drag &Drop, Multiphysics & Neural Net-based Lab-on-Chip Optimization Software
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Proposal No. B1.03-8019

Description and Objectives

- Develop a novel simulation tool for complete biochip system design, analysis and optimization

- Train ANN represented components in a data-driven mode using data obtained from multiphysics simulations, resulting in no loss of fluid physics in ANN approach (as opposed to point/PDE approaches)

- Create virtual library of components resulting in an easy system building and quicker analysis

- Develop a unified computing environment that couples ANN models and optimization tools
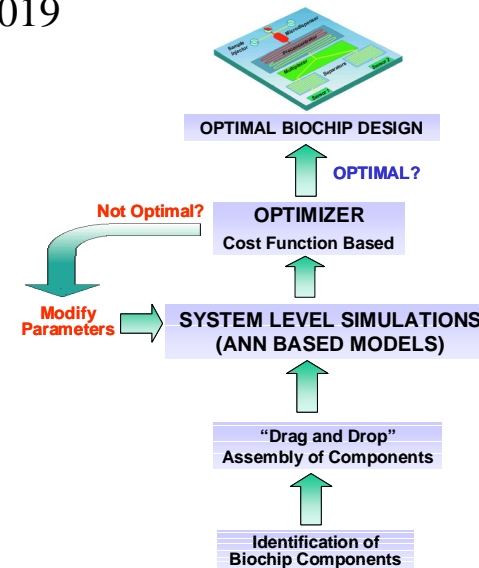
Proposed System-Level Design Software/Methodology

Approach

- Represent "standard" microfluidic components via trained ANNs and develop virtual parts library

- Integrate all components in GUI driven, drag-and-drop assembly, results in minimal training and versatility (end user with no formal CFD training)

- Perform system level simulation and optimization (via developed optimizer) to arrive at optimal design and process conditions

Subcontractors/Partners/Consultants

Professor Chong Ahn, University of Cincinnati

Dr. Tony Ricco, Aclara Biosciences

Schedule and Deliverables

- Phase I (Six Months): Preliminary GUI-driven tool to perform drag-and-drop assembly based system level simulation and optimization
- Phase II (two years): Comprehensive parts library, optimizer, fully functional GUI with post-processing, automated optimization, and "user parts" addition capabilities, software for ANN training

NASA & Commercial Applications

- NASA: A unified (chip-layout, solver and visualization) computing software for Biochip design analysis
- Commercial: Biochip manufacturers (Aclara, Caliper, Packard, Tecan,, etc.), Other pipeline network systems